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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS
FOREST PRODUCTS
FOREST ECONOMICS
RANGE RESEARCH

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BRANCH OF RESEARCH

September, 1931

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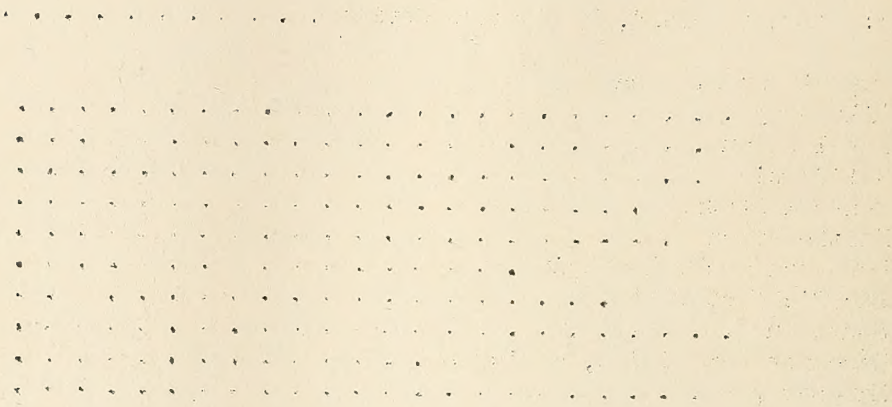

FOREWORD

TEMPORARIES

By
Perkins Coville

It must be admitted that the practice of using forestry students and others as temporary workers at Forest Experiment Stations has its good and bad points. The protagonists of the custom will say that, in the case of forestry students or graduates of forest schools, there are two arguments in favor of the practice; that the individuals presumably have a more or less sincere interest in forestry, and that among them there are often promising men who may develop into permanent research appointees. The antagonists will say, and this is all too true in many cases, that the men are raw and untrained; that there is a comparatively rapid turnover interrupting the continuity of work and involving frequent breaking in of new men; that the schools are not as helpful as they might be to see that we get the men who are best suited to research work.

We no doubt flatter ourselves that we are weeding out the unfit and encouraging the fit. But are we making the most of the situation?

There is plenty of routine work to be done in forestry research, and the temporaries probably have their greatest value at present in helping to take the load of routine measurements off the shoulders of the permanent staff. But there seems to be too much of "Do this" and Do that" without telling the temporary why it is to be done and what is the objective of the work. There is often too little effort on the part of research officers to determine a youngster's interests, his abilities along other lines than the one he happens to be temporarily engaged in, and whether or not he would like to use his next year or two of school definitely to fit himself for some particular phase of work if the various phases and their opportunities were discussed with him and explained. Many a man who has been dropped from college, or puttered at one thing after another, has developed into a highly successful individual when he found his niche. A man who does not prove satisfactory when tallying trees on one sample plot after another, might prove exceptionally good on erosion or fire studies.

The child is father of the man. There is a definite need for each research officer to offer proper encouragement, advice, and training to younger men if we are to fill our ranks with good new material through the years to come. The habit of encouraging, stimulating, and training the younger men, both permanent and temporary, will unquestionably bear fruit, will create a better morale, and will be handed down by the younger men when they grow older.

The following table indicates the extent to which temporary workers at the various stations have been taken into the permanent staff.

(Over)

Temporaries at Forest Experiment Stations

Station	Years covered	Total number temporary employed	Entering Research permanently	
			Number	Per cent
Allegheny	4	10	0	0
Appalachian	7	33	7	21
California	4	43	5	12
Central	4	18	2	11
Intermountain	1	5	1	20
Lake States	7	48	6	12
Pacific N. W.	7	44	7	16
N. R. Mt.	7	24	2	8
Northeastern	7	40	7	17
Southern	7	34	5	15
Totals and average percent		299	42	14

ALLEGHENY FOREST EXPERIMENT STATION

July, August, and September

General

For a second three months' period the revision of the Capper Report data for Pennsylvania and New Jersey, and to a lesser extent emergency estimates for unemployment relief, have at times threatened to break down the administrative organization of the Station.

There has seemed no halfway method of dealing with the Capper Report revision. Anything less than a thorough-going analysis and use of available information would have resulted in figures in which the Station had no faith, and which the Branch could not have confidently used. The Pennsylvania Department of Forests and Waters had in its Forest Survey of 1924-1926 probably the most complete information on the forest resources of the State which any State Department is likely to have. This survey was based on an actual map of all of the forest areas in the State in excess of 50 acres, and an estimate of those below that size. The forest acreage, both for the large contiguous bodies of timber, and for the smaller detached areas which are chiefly farm woodlots, was reported in four classes, none of which unfortunately quite coincided with any of the classes recognized in the revision of the Capper Report. Finally, there was an estimate, both in board feet and in cords, of the total volume of merchantable timber in the State. From other State sources the area of forest types was quite reliably obtained, and the acreage of a number of classes of ownership. The problem was to use all of this great mass of data critically, in the light of information obtained from other sources, and to translate it into terms prescribed in the general directions for revisions of the Capper Report. Much more intensive effort was justified by these data than by the extremely sketchy information available from the State of New Jersey. Practically nothing has been published in New Jersey in recent years along these lines, and in spite of farm land abandonment and metropolitan development no change has been made in the published acreage of forest land in the State for 30 years. On the other hand, the New Jersey authorities furnished us with some excellent stand data, drawn from actual cruises of considerable tracts.

One conviction has constantly grown, that is that our figures should not be given by States, or by still more artificial groups of States, but by forest types. If all our labor is to count for the most we must get away from the artificialities of State boundaries. Suppose one wishes to compare from our figures the performance in fire control of two States like Pennsylvania and New Jersey. The percentage losses for the States as a whole would be entirely misleading. Three per cent of the oak-pine type of South Jersey is burned over annually, and only one per cent of the oak-chestnut-yellow poplar type of north Jersey. The State average compared with the average for Pennsylvania, which has no oak-pine type whatever, and of which one-third is a type that probably burns very little under

ordinary conditions, would lead one inevitably to conclude that the performance of the New Jersey State Fire Service is far below that of the Pennsylvania Fire Service. We believe that very few competent observers would admit that this was the case. To lump together statistics for utterly diverse forest types is like adding up cats and dogs and expecting to get a figure that will be of value for any purpose.

Persuaded that any determined effort to obtain unemployment relief appropriations for the erection of a station building at Philadelphia would simply "rock the boat" for the entire organization, Forbes has proposed to the University of Pennsylvania authorities that an effort be made to raise funds for a new botany building as a measure of unemployment relief. It would seem to be just as easy to raise money for the erection of a building to be used for scientific purposes as for the support of "made work" in city parks and similar projects of vastly less permanent value. Partly for selfish reasons of course, but partly also in order to discharge the debt of gratitude we owe to the Botany Department of the University, the Director has asked University approval for a campaign along these lines among such organizations as the Botanical Society of Pennsylvania, the local garden clubs, Pennsylvania Horticultural Society, the Pennsylvania Forestry Association, and similar organizations to which many wealthy people belong, and which would profit by the prosperity of the Botanical Department of the University. Needless to say our contribution would cease when we had persuaded the various organizations that they should start a campaign among their memberships for building funds. The proposition is now being considered by the higher University officials.

Our buildings on the Kane Experimental Forest were finished on October 1. They consist of an extremely attractive five room cottage for a resident superintendent and a combined laboratory-office-bunk house for visiting station members. We also expect to be able to scrape together enough money to buy the rough tool house erected by the contractor on the site, and to convert it into a temporary garage. Should we later obtain funds for a real garage, the extra building will none the less be very valuable as a tool house and for miscellaneous purposes. The attractiveness of the buildings has increased the number of applications which we have had for the job of local superintendent, but so far we have been unable to locate a reliable party who would be willing to live in the dwelling house rent free but without any other compensation.

With the assistance of four temporary men Hough and Morey have completed the boundary survey of the Kane Experimental Forest. In spite of a reduction in the size of the crew, and the necessity for Hough's spending considerable time on the inspection and administration of the building job nearby, the crew, under Morey's direction, ran 905 chains of boundary, including random lines, with an error of closure of only 1 to 870. At the same time they completed an accurate large-scale map of the entire survey, set cruise stakes every 10 chains, east and west, on the entire boundary, and obtained by the double Abney method the elevation of

all corners and cruise stakes. They established and abundantly witnessed all corners, and marked the entire boundary through the woods with white paint.

On the return trip from West Virginia our party spent a day with the Maryland District Forester, Mr. Buckingham. Maryland has been buying land for state forests in that section of the State, and in addition to some of these lands, the party saw an excellent example of good silviculture in a "sugar-bush". Further east, in Somerset County, Pennsylvania, the Station men paid a visit to the property of the Wilmore Real Estate Company, surface holder for the Berwind-White Coal Mining Company. The total property of 35,000 acres is being handled on a most intelligent basis; the 20,000 acres of farm land are being rented for cash or on shares, and as soon as any land fails to pay its way for agricultural use it is planted with forest trees. However, the plantations of the Company, some of them very interesting, are by no means as significant as the 15,000 acres of land in natural forest. The Company's policy with respect to standing timber is to make improvement cuttings at once, marking for removal all mature trees, and all poorly-formed, diseased, or damaged ones of smaller size. This timber is taken to a small portable sawmill in the woods, where it is most carefully sawed to produce the highest grade of boards, switch ties, and similar products. All cull boards are then sent to a small dimension plant run by the Company, where with the help of electrically driven but extremely simple equipment otherwise worthless material is converted into dimension stock for furniture and other woodworking plants, mine caps, contractors' wedges, sawdust, and some box stock. Utilization is extraordinarily complete, and stock is rarely held more than two or three months before being sold. We have never seen any mill operation so skilfully handled, and believe it to be almost unique in our territory. Mr. E. Burgess is the local manager responsible for this remarkable job. How feasible it would be to handle all of the hardwood lands in our territory in such a manner is of course a question, but without any doubt this particular operation demonstrates what can be done with a reasonably good forest capital.

Management

We have felt extremely fortunate to have obtained the services during the summer, of Dr. L. E. Yocum, formerly of the University of Pennsylvania, now of George Washington University. Dr. Yocum is a plant physiologist of considerable research experience, and he and Wood have worked together on the problem of evaluating moisture-relationships as a factor in the failure of hardwood seedling reproduction in south Jersey. Among the accomplishments of the summer at Camp Ockanickon, probably the most important was the development of a method for satisfactory excavation of root systems. A portable, hand-operated spray pump, mounted on a barrel, was carried into the woods in the back of a light car, and when used within a reasonable distance of a good water supply, proved efficient in excavating even estensive root systems. Operations were begun by

digging a small pit at a little distance from the seedling or tree to be excavated, and if possible downhill from it. The nozzle used gave an extremely fine but high-pressure stream of water, which washed out the smallest roots without injury; the water flowed away into the pit. With this apparatus it was possible to excavate fairly rapidly seedlings with a root depth up to two or three feet. On larger growth the work necessarily went extremely slowly. Work was begun early in September on the root system of a white oak, which had been cut in 1929, and had a two year growth of good sprouts. Some of the roots from this individual were traced to a distance of 8 or 10 feet, but the excavation of the entire root system would have taken a whole summer. A more powerful stream of water could of course have been applied with a smaller expenditure of time, but would undoubtedly have destroyed the finer roots. The main point established by this work was that in spite of the vigor of the sprouts, in two years' time about half of the root system of the original tree had died, and that dying was still going on. This is extremely important in a region where up to this time the forest has been renewed entirely from sprouts, and where it is very desirable that we introduce seedlings either by planting or by encouraging natural reproduction.

Total moisture holding capacity for a number of soils was determined, and will enable us to put previous records of soil moisture on the basis of wilting coefficients. An extremely bad drought in July, a rather humid August, and a dry September presented highly desirable variations in moisture in the soil. Dr. Yocum tested the leaves of some of the vegetation with cobalt chloride paper, and found that during the dry weather both shade and sun leaves of the oak had their stomata entirely closed. Greenbrier (Smilax) was transpiring under the same conditions. In studying the stomata Dr. Yocum has successfully used the method of field immersion of the tissue in alcohol which preserved the stomata in the same condition as at the time of collection. In some simultaneous studies of the translocation of starch in leaves of several species it was necessary to start the first observations at 4:30 a.m!

A Hellige soil tester was used to determine acidities at various points in the Ockanickon tract, and checked very well against the potentiometer. The top soils in general are extremely acid, running down as low as 4.0, and not going much above 5.0. Observing the apparent greater number of oak seedlings in the less acid soils, and learning from the literature that oaks are supposed to do best on soils near the neutral point, the investigators laid out a modest experiment with plots of artificially established acidities. Three 10 foot square plots were laid out, one of which it was aimed to bring up to just under neutrality, another near 5.5, and the third to be left as it is, but dug to compare with the other plots. Ground limestone is to be used in producing these experimental acidities. Screened acorns will be planted on each of the plots if the seed is obtainable this fall; it seems to be extremely scarce.

Almost no oak seedlings were found which were making what appeared to be satisfactory growth. The great majority have been killed back in the tops, from what cause is not known, and almost all have likewise lost their tap-root. Mr. Doak is cooperating in a study of the root difficulties.

H. J. Lutz, formerly of our staff, spent the summer studying the vegetation of the New Jersey sand plains, an area of extremely scrubby growth not far from Camp Ockanickon. He made Camp Ockanickon his headquarters, and his presence was an invariable stimulus. A study of the vegetation of the plains will be the subject of his Ph. D. thesis at Yale next year.

Special Studies - Mycorrhiza

After many tribulations, the first of which was the failure of our special glassware to arrive from Germany at the time expected, Hatch set up a substantial number of his pure culture apparatuses in the laboratory at the Boyce Thompson Institute. Our experience with ordering special glassware from abroad, even from so reliable a firm as the Jena Glassworks, would make us hesitate to repeat the process, even at a considerable saving in cost over American glass. Dr. Crocker and his associates could not have been more cordial or more helpful, and our needs have been supplied at every point. Hatch left on September 26 for a two months' furlough at Harvard, and on his return to Yonkers can tell a great deal more than at present about the probable success of the sterile culture method of growing tree seedlings for months in closed, aerated flasks, both with and without mycorrhizal fungi.

Forest Pathology

The work on general forest tree diseases during the past season can be separated as follows: (1) locating fire free cut over areas of coppiced hardwoods for the decay of sprout hardwoods project, (2) observations on general forest tree diseases in the Allegheny region and (3) laboratory experiments dealing with damping-off diseases of coniferous seedlings.

A number of plots were located on apparently fire free cut over areas of sprout hardwoods. The plots are representative of the region and located as follows, Ligonier, Pa., Dauphin, Pa., Petersburg, Pa., Garrett County, Md., Kampe, N. J., Split Rock, N. J., High Bridge, N. J., Ellicott City, Md. We have the locations of a large number of cut over areas in Maryland and Pennsylvania which have not been investigated. Data sheets were drawn up and a number of stumps were measured on several plots as a general preliminary study. These data will be analyzed in order to determine the course for further procedure. Some of the stump measurements aside from the decay data were, (1) diameters of heartwood, sapwood, outside bark and inside bark, (2) total number rings, number rings of heartwood and sapwood, (3) width of inner ten and outer ten rings, (4) stump height. Complete data of course were recorded on decay and scars.

A number of stumps were dissected in order to trace the origin of decay. Dissecting large dry oak stumps however is a slow laborious method for studying butt-rots. Incidentally a large amount of information was picked up on the economic status of portable logging operations in the region.

Some of the general forest tree diseases observed in this region during the past season are as follows: (1) Scarlet and red oak dying in Garrett County, Maryland; (2) a severe case of cankered birch, both black and yellow, on the Allegheny Plateau in Plotter County, Pennsylvania; (3) widespread oak (red, rock and white) dying in Pike County, Pennsylvania; (4) widespread dying of Ailanthus in the Philadelphia region, (5) a brown lesion canker on white pine which has been found associated with fairly large areas of dead white pine at Fort Frederick, Maryland; Mont Alto, Pennsylvania; Petersburg, Pennsylvania; Knobsville, Pennsylvania, and at many other points not associated with dead trees. The material from Fort Frederick readily yielded pure cultures of an unidentified fungus; (6) widespread dying of oak second growth in the 20-year old stands around Ligonier, Pennsylvania; (7) needle rust on Scotch pine in the Stokes Forest, N. J.; (8) twig blight on Austrian pine at Mont Alto, Pennsylvania, and in New Jersey. Many other general diseases have been recorded which for the time being do not require immediate attention.

Numerous inquiries and specimens have been handled on nursery diseases and general tree diseases for the country as a whole. A serious case of seedling injury at the Bailey Nursery, St. Paul, Minnesota, has received attention for over a year. This summer the injury was finally diagnosed as strawberry weevil injury. The weevils gnaw the bark from the roots. The adults appear on the surface of the seedbeds about June.

Numerous specimens of wood rots and general tree diseases were collected. Several authentic sporophore cultures have been obtained, particularly Hydnum erinaceus. A new non-precipitating nutrient solution was tested this summer against a regular solution at PH 5.0, in quartz sand cultures, with western yellow pine, Scotch pine, Douglas fir and white pine. The solution proved to be non-toxic and both root and top growth was practically the same for both the regular and the new non-precipitating solutions.

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APPALACHIAN FOREST EXPERIMENT STATION

General

During the month Frothingham visited the 1050 acre estate of Senator Cameron Morrison near Charlotte, North Carolina, and made recommendations for the development of the area, which is largely wooded, as a hunting preserve.

Supervisor Mattoon, of the Pisgah, and Frothingham inspected the spruce stand on the east slope of the Black Mountains with reference to its suitability for a natural area. The area includes a belt of spruce-fir and yellow birch timber, averaging about 15,000 board feet to the acre for some 3,000 acres. Single acres were estimated to yield as high as 30,000 board feet of spruce and fir. The timber is apparently well located for a natural area since it is only about 2-1/2 miles from a state highway and yet presents a difficult logging chance. This land is of high scenic and recreational value as it skirts at one end the State Park which is accessible by way of the Mt. Mitchell motor road.

MacKinney reported to Washington where he will spend the winter in the section of Forest Measurements on the analysis of data on increased growth of loblolly pine released from competition.

Hursh visited streamflow and erosion experiments in Utah and California.

Branch Stations

Barrett and Sims visited the Monongahela National Forest where they made notes on possible locations for a branch station.

Methods of Cutting - Hardwoods

Buell and Manchester reexamined the six 1/2-acre plots at Bent Creek that were cut-over last winter. The positions of all the reproduction on 20-milacre quadrats on each plot was mapped last summer. These maps have furnished a means of making an accurate check on the amount of damage done by logging to advanced reproduction. The milacres were evenly spaced across the plots in two strips. No special attempt was made to protect them while the areas were being cut over. Consequently some of them, through which skid roads were made, were scraped nearly bare while others were hardly disturbed. The proportion of area on which the reproduction was severely damaged, lightly damaged, and undamaged is about the same on the milacres as on the plots as a whole. Nowhere on the plots is new seedling reproduction prolific; in no case did the number of individuals established this year equal the number which were already growing on the milacre when the cutting was made.

Forest Management in North Georgia

Work on the white pine release plots on Cooper's Creek was completed during the month. Of 5 plots in the series 3 were treated by killing of the hardwood overstory and two were reserved as checks. The removal of the competition offered by the overstory was accomplished partly by means of girdling and partly by a combined girdling and poisoning process made possible by a tool devised by MacKinney. Time studies based on approximately 200 trees treated by each method showed the poisoning tool to be somewhat faster than the axe. In the treated stand where diameters ranged from 3 to 30 inches it was necessary to refill the tool with poisoning solution after about every 40 trees.

An arrangement has recently been made whereby the Georgia Mountain Experiment Station agrees to furnish the Union County High School at Blairsville with stove wood. This greatly facilitates the cutting studies.

Management - Loblolly Pine

During the last week in the month Abell, MacKinney, and two field assistants started the reexamination of selective logging permanent sample plots established at Franklin, Virginia, in November, 1929. Preliminary examination of the plots showed a marked paucity of loblolly pine reproduction and a very dense ground cover of grass and sedge. Most of the loblolly pine reproduction on the plots appeared to have been present at the time of cutting. If more pine does not become established on the plots within a few years, hardwoods will undoubtedly assume predominance in the stand.

Fire Damage Studies

Sims, Nelson, and Phelps visited the McFalls Creek burn on the Natural Bridge National Forest. They will reexamine the plots originally intended for a study of sale area betterment work, but which were burned over in the spring of 1930, and will gather additional data on the relative susceptibility to fire of various hardwood species.

Forest Insect Investigations

During early September several group killings of the southern pine beetle, each consisting of from fifty to one hundred trees, were noted in the Pisgah National Forest. These areas are the only ones known where the beetle is at all active this season. A deficit in rainfall of about seven inches, which is considerably more than in other localities, is undoubtedly a contributing factor for the multiplication of this insect here.

Larvae of the yellow striped oak worm (Anisota senatoria S. & A.) were abundant throughout the Pisgah Forest and also in other localities visited in Western North Carolina during the month. A considerable proportion of the crown on southern red, black and scarlet oak trees was noted to be defoliated in these areas. The larvae were mature by the end of the month and feeding had about ceased.

Because of numerous requests for information relating to the control of the southern pine beetle under shade tree conditions, trees recently infested were sprayed during the month with kerosene and with orthodichlorobenzene. Preliminary results indicate that kerosene is effective only in killing those beetles which have not extended their

galleries more than one-half inch under the bark. It appears that the kerosene is not penetrating enough to reach them through the bark. Furthermore, it does not prevent subsequent attack. On the other hand, crude liquid orthodichlorobenzene is effective in killing the beetles even after the galleries are fully extended, kills the eggs and tiny larvae, and appears to prevent subsequent attack.

During the month an analysis of field data was completed relating to the extent of losses caused annually by the southern pine beetle to stands of old field pine present on the Bent Creek Experimental Area of the Pisgah National Forest.

Doctor Carl Hartley of the Bureau of Plant Industry and Dr. Overholtz visited the Bent Creek Laboratory. They were much interested in the blue stain associated with beetle-attacked pine trees, and especially in Caird's physiological work to determine the relative importance of the stain and beetles in causing sudden death of the host trees.

Forest Biology

Because of the warm clear weather during September breeding birds have lingered in this region far beyond their usual time for departure and the migration of northern birds has been delayed.

A banding station has been organized which has been successfully operated despite the abundance of natural food. As many as five birds have been captured and banded during the course of a day.

Weekly field trips to Mount Mitchell have been continued and one day during the month was devoted to a study of bird life in the Great Smokies.

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CALIFORNIA FOREST EXPERIMENT STATION

General

Additional men for the Station staff arriving during the month were M. W. Talbot, who comes from the Bureau of Plant Industry to head the new grazing research, and F. G. Renner, formerly at the Intermountain Station, also to the grazing staff. To aid in starting off the grazing work, Chapline came out from Washington and sanguinary powows (still without any casualties, however) have been the order of the day whenever the whole

squadron has not been out in the field trying to find out what grazing is doing to California and why.

Munns of the Washington Office also spent three days with us making us prove our alibis for living. The Station also received a call from Dr. Boyce of Yale, who thinks the California Station has too fine quarters to be able to do any work in.

Forest Management - Pine Region

Dunning attended the Portland conference called to harmonize methods of estimating growth for the Extensive Revision Report. After leaving Portland, he went to Wind River to see Isaacs' work in the study of natural reproduction, and then to Priest River where some of Haig's and Gisborne's work was visited along with other Station activities. Upon returning to Berkeley he spent several bitter days regretting compromises agreed to at the Portland conference. The necessary changes through all the myriad forms, columns, and lines have been finished, we hope.

Hasel and Hormay finished the installation of the grazing - reproduction study plots in Jeffrey pine, eastern Plumas.

Reineke and Clements joined Evans and Hasel on the Plumas in completing the preliminary field work for the check of cruising methods and volume tables. The timber will be cut and scaled next spring.

Forest Management - Redwood Region

Work on the redwood studies was about equally divided between the office and the field. The office work consisted principally of work on the planting study records. Through the kindness of Lawrence Merriam data on redwood planting collected under the direction of Mason and Stevens were made available for use.

Two weeks were spent on a study of present logging methods and the effect of the various methods on the logged areas, chiefly on the Hammond - Little River Redwood Company operations. As this company is operating two slack-line sides, a high lead side and a "cat" side it was possible to compare the three methods. A large number of photographs were taken to illustrate the effect of chopping, yarding and burning on the non-utilized part of the stand. The slack-line method results in complete destruction. The high lead is somewhat less destructive. Many of the "cat" areas, where reasonable care was used in burning, have a satisfactory reserve stand. It is also evident that the heavier the redwood stand the greater the destruction.

The Pacific Lumber Company is using the slack line method of yarding, knocking down every thing, and the Union Lumber Company is using a "Flyer"

sky line. The long corners are being yarded to the "Flyer" with "cats" and a fair scattering of seed trees is being left. All companies are burning between chopping and bucking except Pacific which is burning after yarding. The latter is made possible by their utilization of redwood bark, and saves much loss of sap clear lumber.

Natural Areas and Experimental Forests

Wieslander with Dunston of the Regional Office, visited the Stanislaus, Eldorado, Lassen, Modoc, and Trinity national forests in connection with the Natural Area - Experimental Forest program and, incidentally, to check up on type map progress on these Forests.

The major accomplishment was the finding of an area on the Lassen suitable for an Experimental Forest. This area is an excellent cross-section of east side conditions and embraces the two principal sites and types in the commercial timber belt of the region, namely, Sites III and IV in the western yellow pine and western yellow pine - white fir types. It has a total area of 8,600 acres of timber, averaging about 20 M feet B.M. per acre. Ninety per cent of the stand is western yellow pine with 8 per cent white fir and 2 per cent incense cedar. The segregation of this area as an experimental forest will in no way interfere with the operation of surrounding units of timber. It is admirably located for small-scale logging operations as an average down grade truck haul of 3 miles will take the logs to a siding on the new Great Northern-Western Pacific extension into California. This makes the logs saleable to two mills in Susanville, both of which buy a considerable footage of gypo logs annually.

The area has yet to be passed on by the grazing men but the presence of open grass and sagebrush flats should make it suitable for range experiments.

Another advantage of this area is its close proximity to the proposed Swain Mountain Experimental Forest, containing red and white fir types, which will make possible the administration of the two forests from a joint field headquarters.

In addition to this Experimental Forest four natural areas were tentatively selected.

Cover Types

Tom Harris, in charge of the Ribes Survey on the Klamath National Forest, recently brought in the year's contribution of the Office of Blister Rust Control to the cover type project. This consisted of an intensive cover type map of 193 square miles within the sugar pine

belt of the Klamath. The map is of excellent quality, being based on the strip method with 4 strips through a section. Mr. Harris spoke enthusiastically of the new Region 5 type scheme which was used for the first time this year in the Blister Rust Surveys.

Forest Influences and Erosion - Erosion and Streamflow

August and September were devoted chiefly to a survey by Lowdermilk of watersheds and watershed studies in other western regions. The Boise watershed study was first visited in company with Renner and Craddock. In the section visited, cutting out of alluvial fills in drainage channels was the most conspicuous feature of the landscape. Of particular interest was the setting aside and fencing of areas from 20 to 200 acres to exclude all stock in order to study the recovery of vegetation. Such exclosures allow the native vegetation to respond and become an expression of the prevailing climatic conditions, and will serve to show the potentialities of the region in the production of vegetation, as well as for erosion and run-off control. A most constructive piece of work at the present stage of development of experimentation, is to locate and fence tracts to protect representative areas of a region from all use and from fire. One area for each type of vegetation is not sufficient. Replicas are highly desirable, certainly not less than duplicates.

A specification in the laying out of such exclosures, which requires careful planning is to enclose a complete unit of a drainage, however small the area. For example, the drainage channels which may course through the exclosure should be a direct reflection of the surface control of vegetation within the same unit. A drainage channel which originates beyond the exclosure and leads through the area may not only cause trouble, but may express an over-grazed condition outside the area. It is, therefore, of high importance that such exclosures not only combine the object of exhibiting the restoration of vegetation, but that of erosion and run-off control. All such measures are highly desirable for influence and erosion studies, or erosion and streamflow.

The stage is set in Utah, surrounding the Great Salt Lake, for one of the most unique and instructive studies of processes of erosion. The essential feature of the situation, however, is that the ancient Lake Bonneville Terraces furnish a time scale for the measurement of erosional debris which has been washed out of canyons draining into the Salt Lake basin. The field trip with Professor Becraft and Bailey over the watersheds from which disastrous floods occurred in 1930 was especially interesting. A flood was staged, it would appear for our trip, in which full effects of an outwash of debris on highways was observed before it had been cleared away by the State Highway Commission.

The phenomenon of mud flows was studied in this section. There is little known about these remarkable and destructive flows. The performances of a mud flow under way must be seen to be believed, so fabulous

do they appear. In the mud flow lurks a menace little imagined by those unacquainted with them.

The outstanding findings in the rapid survey of these areas in company with Becraft and Bailey were: (1) that the heavy run-off which gave rise to these flows came not from the steepest slopes but from gentle slopes; (2) that the heads of the canyons, with deep soils and lower gradients had been over-grazed and exhibited the effects of a greatly accelerated run-off in thousands of newly and deep-cut gullies, which coalesced as they continued into the main drainage channel; (3) that these mud flows had cut down through fills to bed rock and exposed drainage channels of the ancient Bonneville stage, that had not been exposed for thousands of years. In these phenomena are significant processes which merit detailed studies.

The Ephraim Ecological Meeting

The Ephraim ecological meeting furnished a display and discussion of methods of studying vegetation particularly as it related to grazing use. Range management logically is concerned primarily with the production of forage. This brings into the picture, however, considerations of watershed management for water yield and conservation for irrigation and municipal use. When these demands have arisen water often takes on a value greater than forage crops. In that case the objects of management change sometimes without a full recognition of the implications involved. Grazing becomes, therefore, a secondary consideration where water yield is the primary product of watersheds. A contest of the water user and the grazier places the management of watersheds in a position requiring experimental facts.

Erosion in the Colorado Basin

Opportunity was taken to make a field trip over an east - west cross-section of the Colorado Basin from the western divide through Grand Junction to the eastern divide between the Colorado and Rio Grande Basins. Dr. George Steward conducted the writer over that portion of the cross-section from the Wasatch Plateau to Green River, covering a wide range of conditions. So abused is this region that it is well nigh, if not completely, impossible to reconstruct in imagination the original or primeval vegetation. And here again in this region one noted that the fills have been cutting out rapidly since a comparatively short time.

The eastern portion of the cross-section was made under the conductor-ship of Jay Higgins of Region 2. Here again was found the same story. The watershed of the Gunnison River exhibits phases of erosion more serious than are to be found in most parts of California. It is apparent that southern California is particularly interested in the erosion

conditions of the Colorado basin as it may affect the Hoover Reservoir. Erosion was observed to have been accelerated within the basin, along the cross-section referred to, sufficiently to require a careful survey of the situation to discover if the silt measurements of Colorado River water fully express the menace of bed loads of material now under way down stream.

A visit was made into the Pike Forest where a watershed in granitic soils was found to be riddled with deeply incising gullies. It is one of the worst cases on a large scale that the writer has seen in granitic soils.

Roosevelt Studies

An opportunity was happily afforded to visit the installations by Cooperrider on the Roosevelt watershed. It is not until run-off and eroded material from drainages are actually measured that a full comprehension of what goes on during rain storms can be had. The excellent installations on the Roosevelt have already afforded important information.

Sundling is taking graduate work part time at the University. With the new additions to the forest influences personnel, it will be possible to attend to the installations more closely, with the collection of additional supplementary data which will be of first importance in interpretations of results.

Fire Research

Visibility - Binocular Study

A preliminary test was made of different types and powers of binoculars. The binoculars and field glasses were loaned by various optical firms for the tests. The general tentative conclusions as to the various properties needed in binoculars for forest fire detection purposes may be stated as follows: These are stated in relative order of importance.

1. Magnification

Two properties are influenced by the magnification power of binoculars, the increase in the size of the object being viewed and the steadiness with which the binoculars can be held. Six or seven power binoculars appear to give sufficient increase in size and at the same time can be held steady in the hands of the average man. Higher powers tend to cause dancing of the image, which interferes with observation of detail.

2. Field of Vision

The field of vision should not be less than 125 yards in a thousand. The wider the clear field of vision the better for fire detection purposes. The value of a wide field of vision lies in being able to see a wide scope of country at one time and in being able to pick up any small object quickly without delay in searching.

3. Interobjective Distance

The distance between the objective lenses influences the stereoscopic relationship of objects. A satisfactory depth is given to the field of vision and the objects lying in it by an interobjective distance of 115 m.m. Increased stereoscopicity is secured by greater interobjective distances. However, if this distance is greater than 140 m.m. the binocular is very bulky.

4. Illumination Factor

The relative illumination of binoculars varies with the square of the diameter of the exit pupil. Since the eye can not absorb more light than that transmitted through a 7 m.m. exit pupil, it is of no advantage to use a binocular with a higher illumination factor than 50 $(7+)^2$. However, it should be not lower than 36.

The higher illumination up to this 50 maximum, the better the visibility during periods of unfavorable visibility conditions, such as dusk and smoky periods. On clear days this factor has no appreciable effect on observation through binoculars. But since a certain percentage of the days during the summer are hazy or smoky, this becomes an important factor in choosing a binocular for fire detection purposes.

5. Adjustment

Construction allowing adjustment of the eye pieces is to be preferred. Instruments with the center adjustment for one eye cannot be made dust proof. Separate eye piece adjustment allows dust proof construction.

Contact was made in person and by correspondence with optical firms, opticians and other departments of the government using binoculars. Suggestions as to methods of testing, construction, scientific principles involved were obtained.

Visibility - Haze Filters

Advice was sought on the subject of elimination of haze and smoke by means of colored filters from the research laboratories of the General Electric Company, the Eastman Kodak Company, the Navy Department, and from published literature on the subject. Filters were obtained and tested. As yet no definite conclusions can be cited. It appears that the correct color filter for the elimination of haze has not yet been

secured by this Station. From tests carried on thus far we are in agreement with tests which have been carried on by the Navy along the same lines. The results to date indicate that while slight improvement in visibility is secured by the filters there is no appreciable effect.

Visibility Mapping Technique.

Small scale maps and tracings were prepared to provide portable illustrative material for explaining visibility mapping methods.

Several methods and illustrating diagrams for inclusion in a set of instructions for visibility mapping were prepared. These include the method of making a profile, map, determination of the lower limits of visibility, shapes of blind areas, and location of an observation point by graphic solution of the three point problem.

Mapping from the relief model was tried out by means of a glass plate over the lighted map. The test indicates the need for further refinement of the method. The net error as compared with the field method is but 4.5 per cent. However, the location of seen and unseen areas given by the relief model method shows a shifting of these areas. This indicates need of improvement in the sighting apparatus used and the method of placing the light on the peak being mapped. It is very evident that it is absolutely necessary to have the line of demarcation between the light and shadow and the eye in vertical plane. To assure vertical sighting a right angle sight was constructed having cross hairs at the lower opening. A china marking pencil for tracing on the glass is inserted in the side of the sighting stand. The point extends in to the center of the lower opening and forms one side of the cross hairs.

Fire Maps for the Shasta Experimental Forest

Rezoning was done for several maps in connection with the preparation of material for demonstration, Liason Committee notebook, and for use in lookout evaluation for the east side of the Shasta Experimental Forest.

Equipment

A drawing and instructions were prepared for Forest Supervisors to aid in setting up the new fool proof map boards. These boards were described in a previous report.

Motor Patrol

Diary analysis of motor patrol men was completed and route descriptions made. Time studies were also made to secure a representative cross section of the patrolmen's job.

Automotive Spark Ignition Tests

Mr. Curry spent some time during the fore part of the month continuing the spark ignition tests. On account of continued high humidity the experiments had to be discontinued. Present plans contemplate postponing further work until the low humidity period in 1932.

General

Munns spent two days in reviewing the work done thus far on the Shasta Experimental Forest. He reviewed the working plans and gave us valuable information and suggestions that will aid in the work on the Experimental Forest.

Products

Fruit Growers Supply Company Mill Study

Work for the month on the Fruit Growers Supply Company white fir study has been confined to punching and checking of cards. This is now practically completed. A preliminary check run shows the mill run production of green grades before remanufacture to be as follows:

C & Btr.	.4%
D Sel.	3.4
1 Com.	3.2
2 Com.	15.7
3 Com.	33.9
4 Com.	23.8
5 Com.	19.6
Total	100.0

More careful manufacture would have increased the percentages of the better grades somewhat but the average quality at best is appreciably lower than that of the white fir cut in the Stanislaus study. The Fruit Growers mill is cutting in the so-called "East Side" region while the Stanislaus plots represent the "West Side" type. The lower quality is offset, however, by cheaper logging costs in the East Side region so the net losses on white fir are probably about a stand-off in both localities.

Stanislaus Woods and Mill Study

Average tree values obtained by the process of "building up" from average log values are so close to the tree values obtained by the direct tie method that it appears quite unnecessary to secure actual tree correlation between woods plots and green chain in future economic studies.

White Fir Bulletin

R. P. A. Johnson spent a couple of days with Brundage in a final review of their joint manuscript in the series on little used species. Unfortunately white fir dimension is manufactured in substandard sizes and undersized stock cannot be recommended for general use on a parity with competing species which are cut to American lumber standards dimensions. This deficiency from the manufacturing angle, together with poor seasoning practices made it necessary to include a much more detailed discussion of the operators' responsibilities than was included in the larch and hemlock bulletins.

Consulting Entomologist

Cooperative Insect Control

A check-up on results of the Echo Lake control project, on the Tahoe National Forest, was made by G. R. Struble and A. Wagner during the month. This is an intensively-used forest recreational area of about 1,000 acres, containing many summer homes under National Forest special-use permits. In May, 1931, 102 lodgepole and western white pines, infested by the mountain pine beetle, were treated. When this area was again examined in September, but three newly infested trees were found. This is a highly satisfactory reduction in the infestation, and undoubtedly indicates the saving of at least 100 trees from attack during the 1931 season.

A party of eight men, consisting of representatives of the Pickering Lumber Company, the Forest Service, and the Bureau of Entomology, carried out a joint survey of the Pickering sale area of 100,000 acres on the Modoc National Forest, September 14-19. Under the contract of sale the purchaser of the National Forest timber is required to conduct control work on both the forest and private lands whenever the seasonal loss due to insects reaches an average of 3 per cent of the stumpage volume. It was found that the 1931 loss for this area was slightly over 2 per cent, and that control work could not be required under the contract provisions. However, the volume of western pine infestation was more than double that for 1930; and in view of this alarming increase plans are being considered for undertaking a joint project by the Forest Service and the private company during the coming winter.

J. M. Miller and K. A. Salman, with T. D. Woodbury and R. Jones of the Forest Service, met representatives of the McCloud River Lumber Company at their White Horse camp in northern California to consider the advisability of carrying on western pine beetle control work on an area of 25,000 acres where the lands of this company interlock with National Forest holdings. The McCloud Company has been active in protecting its timber from this beetle, having spent from $10,000 to $15,000

annually on control work since 1915. In view of the aggressive infestation which developed in the White Horse area during the 1931 season, work will probably be continued during the coming winter to protect both Forest Service and private lands.

Field Assistants Johnson, Wohletz, and Plair were engaged on the annual survey of the eastern Lassen Working Circle during September. This area was found to be in a very satisfactory condition as regards the western pine beetle infestation. No increases developed during 1931, and in some sections the infestation had evidently decreased. This condition is in striking contrast to those which have been found on the Modoc and Sierra National Forests, where heavy increases have developed.

White Fir Studies

Tree injection experiments were resumed by Doctor Gordon, assisted by Wagner, from September 1 to 8. During this period a number of white fir trees were impregnated, and the progress and distribution of chemicals and dyes studied. Injection experiments carried on later in the month included medium-sized trees which had fading foliage and bore every indication of containing broods in the upper bole. Two-top-killed white fir with recently-fading limbs below an old kill were also impregnated with chemicals to test the possibility of preventing further attack. For each tree impregnated, an untreated check tree was left. In addition to white fir, an attempt was made to impregnate a top-killed sugar pine. This tree, however, responded quite differently, in that the solution was not taken in by the tree, but rather forced out by the pressure.

One striking discovery made during the course of this season's experiments was that fir balsam, which is secreted by the white fir tree and deposited in blisters in the bark, is highly repellent and toxic to the fir engraver beetle (Scolytus ventralis Lec.).

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CENTRAL STATES FOREST EXPERIMENT STATION

General

Mr. Willis M. Baker assumed his duties as Director of the Station on September 18. Mr. Baker comes to us from the Pennsylvania Research Institute at Mont Alto, Pennsylvania, of which he has been Director since its establishment. Prior to his work at Mont Alto, Mr. Baker was

Associate State Forester of New Jersey. Mr. Baker's long and successful experience in both the research and administrative fields, and his familiarity with farm woodland problems renders his appointment a fortunate one for the future of the Central States Station.

Litter Study

Auten spent the month in compiling data secured during the summer field season on soil specific gravity and rate of water absorption. As a result of comparison of thirty-six second growth sites with adjacent field sites, it was found that the porosity of second growth areas is not lost through cutting, providing grazing has not been practiced to excess. The final figures for specific gravities on the plantation and corresponding field areas show that the soil porosity from old fields comes back under plantation woods in from twenty to twenty-five years. In a comparison of grazed and ungrazed woods, the surface nine inches of soil in the grazed woods was found to be approximately fifteen per cent heavier than in the ungrazed woods. The final figures on the rate of water absorption at different horizons in the virgin woods and adjacent fields were found as follows: at a depth of one inch below the surface, the rate of absorption in the virgin woods was 205 cubic centimeters of water per minute; at the corresponding depth in the field, only 4.4 cubic centimeters per minute; at the three inch horizon, the rate in the woods was 75.6 cubic centimeters per minute; in the field, 5.3 cubic centimeters; at the lower horizon, or eight inches below the surface, the woods soil absorbed 10 cubic centimeters per minute and the field soil 4.2 cubic centimeters per minute.

These averages are based on an ample number of cases to make the results generally applicable to this region. There seems little basis for the assumption that wood soils will hold no more water than field soils when the rates of absorption in the woods at a depth of one inch are nearly fifty times, at three inches seventeen times, and at eight inches two and a half times that in the adjacent fields; and when the specific gravities of the woods soil are so much less than that of the field soil. These figures give us a clearer picture of what takes place when a heavy rain falls. One can easily see that the run-off following any ordinary rain would be practically none in the woods and very great under field conditions. The connection of these data with the erosion problem is at once clear.

Plantation Project

Many very good stands of planted black locust in Jefferson and Ripley counties, Indiana were visited and plots were taken in them by the two field parties. Hall returned to Ohio in the early part of the month, to follow up the emergence of borers and to secure other data on this year's heavy infestation. Just before returning to Columbus

Rayner's party gathered entomological data and established a plot in a very young planting which was being rather forcefully pruned by its owner. Hall plans to watch the course of the borer infection which is present, and perhaps use the stand to try out various sprays experimentally.

The tallest stands of locust which have been found in the Central States occur in Jefferson County, Indiana. One stand, in Paris, Indiana, is eighty-eight feet tall at forty years. Within the stand, diameters run up to thirteen inches, and one outside tree is about twenty inches DBH. The tallest tree on the plot is ninety-four feet. The planting was established with locally procured "sprouts." Another excellent stand, planted on limestone soils, southwest of Dupont, rises to about seventy-five feet in thirty-one years. Diameters here are up to fifteen inches.

Early evidence of locust borers appears in both of these stands. This is in accordance with observations in Ohio, which indicate that the very best plantings are not immune to the borer in their youth, but that the quality of the site is such that the trees recover and grow thriftily in spite of the insect damage.

From September 18 to 20 Chapman and Kellogg were in Ann Arbor, Michigan, where the locust plantings and mixtures on the Saginaw Forest were visited. It was found that all pure stands were within the limits of data already well covered by plots, and consequently no additional data were taken. The walnut-locust planting, however, was of special interest and a plot was taken and soil samples were collected.

Map Record

The county maps which have been collected throughout the field season, have been compiled by Kellogg into an atlas binder. These maps show the location of all plots and plantings found by field parties. A regional map has been started, on which all black locust plantings are plotted.

Woodland Grazing

Reconstruction Phase

A total of fifty-three permanent sample plots were established during the field season. Many of these were areas which had been located and measured as temporary plots during the season of 1930. Thirty of these areas were identical with plots taken last year in connection with the study of regeneration on classified woodlands of Indiana, and constitute a remeasurement which will be incorporated in the manuscript which Day and DenUyl have prepared on this phase of the study.

Livestock Management Phase

Mr. Brunner, Manager of the Pinney Purdue Farm, reported that on September 20 the animals in the twelve acre and eighteen acre tracts were weighed, and that they showed a rather heavy loss over the September 1 weighings. He attributes most of the loss to the unseasonable heat and to the flies, which have been extremely bad this season. A second weighing on September 24 showed a slight gain for the animals in the eighteen acre tract but no change in the weights of those in the twelve acre tract.

Extensive Revision RE

Compilation of forest resource data for the Central States Region was continued by Kuenzel. Figures of average annual growth and drain for the seven states assigned to the Station were completed under the direction of Professor E. F. McCarthy of the New York State College of Forestry. For the state of Ohio, it was determined that the forest growth is equivalent to approximately 90 per cent of the annual cut, indicating a depletion of existing stands at an alarmingly rapid rate. Similar conditions prevail in other states of the Upper Mississippi and Ohio River Valley, as indicated by the low average increment in forest capital for the various states studied. Although occasional stands grow remarkably well, the practice of culling heavily to supply a changing market and the prevalence of grazing in woodlots throughout the region has materially lowered the density and the rate of growth of the average stand.

A forest type map of the region embraced by the activities of the Central States Forest Experiment Station has been made in connection with the study of forest resources. The map represents all information available from authoritative sources in the several states. Photostatic copies of this map have been prepared and submitted to State Foresters and others familiar with the forests of the region, for criticism and revision. It is hoped that more detailed determinations of type boundaries will evolve from this beginning.

Chestnut Oak Regeneration

Kellogg took the opportunity, while in southeastern Indiana, to revisit the three chestnut oak plots established in 1929 by Barrett at the Clark County State Forest, in order to secure repeat photograph of the clearcut, partially cut, and check plots. He reports that stump sprouts on the clearcut plot are very vigorous (in many cases over 12 feet high) and are rapidly filling in the space. On the partially cut plot, the residual stand is growing rapidly, as evidenced by expansion of the bark; and sprouts from the stumps of cut trees are puny and mediocre. The check

plot appears unchanged to casual inspection. The chestnut oak seedlings on the check and partially cut plots are not conspicuous. On the clear-cut plot they are completely outdistanced by the stump sprouts. In the shelter of uncut trees on the borders, considerable amounts of seedling reproduction appear thrifty, although of small size.

Locust Borer Investigation

Sample Plots

On September 15 the Forest Service yield crews finished up their field work for 1931. Rayner and Cummings were released from that work and during the latter part of September assisted Dr. Hall in a study of the locust borer in Michigan. Black locust plantations were observed near the following places in Michigan: Ann Arbor, Jackson, Lawton, South Haven, Alma, Saginaw, Clare and Higgins Lake.

General

On September 21 a conference was held with Professor R. H. Pettit, State Entomologist, and Marcus Schaaf, State Forester at East Lansing, Michigan, concerning locust borer infestations in Michigan.

Locust borer damage, in general, seemed to be more severe in Michigan than in either Ohio or Indiana, but in Michigan the black locust was growing quite slowly for the most part and this may help to explain the heavier infestation. In several plantations where the black locust was growing rapidly, there was comparatively little damage by the borer.

Life History Studies

On September 14 the first act of oviposition was noticed at Xenia, Ohio. Fifteen females and seven males were noted actively running up and down the trunks of black locust trees in a small, young plantation. Three pair of beetles were noted mating on the trees and two females were observed laying eggs.

On September 16 another plantation was visited at Jackson, Ohio, in which mating and egg laying was actively taking place. In this plantation, fourteen pairs of beetles were observed mating on the trees and a larger number were observed laying eggs. To date very few beetles have been observed on goldenrod, and no mating on this plant has been observed to date. Several instances of egg laying and mating on black locust trees were observed in Michigan. In one instance the females were busily engaged in laying eggs during a moderately heavy shower.

NORTHEASTERN FOREST EXPERIMENT STATION

Behre spent a large portion of September on the Executive Revision of the Capper Report. Consideration of the summary sheets for the various states in the Northeast led to changes in some of the original figures. The figures were reviewed by a number of men in the region. A real interest in the project was displayed on all sides but the inadequacy of the basic data is generally recognized. The job has tended to stimulate interest in a comprehensive survey of forest resources.

The summer meeting of the Northeastern Forest Research Council was held at Newcomb, New York, September 24 and 25. The business session was given over to a discussion of current activities of the experiment station and to the consideration of the Extensive Revision for the Northeast. Mr. Ripley Bowman, Secretary of the President's Timber Conservation Board, was present and was given a good, first hand picture of the difficulties in building up a reliable report. Particular interest attached to the comparisons of some of the preliminary figures with similar figures in the original Capper Report. An increase of about two and one-half million acres in total forest area is indicated by the present report. The deforested area in New England which was reported as more than five and one-half million acres in 1920 is now given as less than one-half million acres. A decline of fifteen per cent in the softwood sawtimber is shown but this is more than offset by the fact that more than twice as much hardwood sawtimber appears in the present report.

On September 1 Richard H. Blythe, Jr. joined the station staff as resident superintendent of the experimental forests in the White Mountains.

After completing the remeasurement of a number of the plots in Maine which were set out in 1924 and 1925 to study the growth of cut-over spruce lands, Westveld went to Newcomb, New York, to supervise the re-tally of the 120 acre experimental area there. This area was established last year in cooperation with Finch, Pruyn and Company and the Cornell Department of Forestry, to study on a large scale the effect of various methods of cutting in spruce and northern hardwoods. Cutting of merchantable pulpwood and girdling of defective hardwoods in accordance with the marking done last year was accomplished during the spring and summer. A complete tally of the residual stand and the reproduction was made to show just what the effect of the logging had been on the various classes of growth. The students at the Cornell summer camp again supplied the bulk of the labor for this job.

Examination of permanent plots established by the White Mountain National Forest to study the results of girdling defective hardwoods in the spruce flat type showed that as high as 36 per cent of the trees girdled had developed "bridges" of varying widths which enabled the trees to reestablish their transpiration currents. Of the various methods of girdling, "notching" appears to be the most fool proof, especially on trees with infolding seams or partially healed wounds.

Doctor Stewart has concentrated his work on the examination of plantations in New York State. For two weeks he was accompanied by Mr. Stuart Hunt of the Conservation Commission of New York State, who has been studying the development of plantations on permanent sample plots maintained by the State. A special condition where a well established plantation of twenty years in age is deteriorating is worth naming. A thrifty plantation of white pine near Norwich, New York, has been chosen as a rendez-vous by large numbers of blackbirds during the past few years. The trees in this plantation show a definite loss in vigor and have become subject to serious attack by the pine bark aphid. Since the bark aphid is thought to be of secondary importance a thorough soil analysis was made. From this it appears that the unsatisfactory condition may be the result of harmful concentrations of the nitrogen in the soil as a result of the abnormal quantities of the droppings from the birds.

Doctor Spaulding spent most of the month working up data secured in the study of the rots of balsam fir. Field data collected on selected plots will correlate interior defect with age, density, and history of the stand as well as exterior appearance of the individual trees. This work will be continued with additional field measurements next year.

Miller spent some time in September running down an apparently well authenticated report that passenger pigeons had been found in western Massachusetts. It developed that this report was in error. Miller reports unusual activity of the red squirrels in consuming a fairly good seed crop produced by white pine in central Massachusetts this year. The effect of rodents in limiting the reproduction which should result from this seed crop will be followed during the coming season.

Miller has also cooperated with the forestry staff at the Connecticut Agricultural College in outlining wild life studies for 4H Club work and in planning investigations of wild life in relation to forest management at the Connecticut Agricultural College.

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NORTHERN ROCKY MT. FOREST & RANGE EXPERIMENT STATION

General

Conferences and the making of plans and working arrangements in connection with organization of the new Station activities and the enlargement of existing work continue to take considerable of Watts' time. The lines of work chiefly requiring attention of this sort were the Survey, Range and Fire Research. Together with Hurtt and Chapline,

Watts spent a week in eastern Montana making initial contacts with the staff of the U. S. Range Livestock Experiment Station at Miles City and going over plans for the range research to be conducted there by our Station. Two other trips made by Watts during the month included one to Portland in company with Weidman to participate in a growth conference on the Extensive Revision project, and another to Region 4 to help in the selection of an experimental forest for the Intermountain Station, an activity with which he was intimately connected before coming to Missoula.

Measuring Fire Danger

The Region 1 fire season of 1931 was ended by regional rains beginning September 9. The rating of the character of this season immediately became a live topic and an important one. Although it was generally agreed that fire danger this year ranked as critical, there was nothing but opinion to decide whether this season ranked below, with, or worse than 1919, 1926, and 1929, the three most recent bad years.

The Spokane office of the Weather Bureau had previously been asked to prepare a compilation of certain weather elements for these three seasons and for 1931, and they submitted this material within a few days after the season ended. Gisborne then prepared charts comparing conditions. This comparison shows that 1931 was worse than the average of these three previous seasons in pre-season precipitation; a little better in fire season rainfall - although August, 1931, was drier than any previous August; relative humidity was exactly the same, averaging 28%; maximum temperature was a little higher in 1931, and wind appreciably less. The net result, therefore, appears to prove that 1931 ranks with the worst of recent fire seasons in this Region, but also indicates that 1931 might have been worse than it was.

The duff and wood inflammability measurements, made at Priest River, were then used to compare 1926, 1929, and 1931. These data readily classify 1931 as worse than either 1926 or 1929 in that both duff and wood were in a condition of explosive dryness this year for many more days than in either 1926 or 1929; while 1926 brought 3 days of explosive dryness and 1929 brought one day, the combination of weather conditions preceding and during 1931 resulted in 44 such days. This condition is recognized as the cause of fires blowing up right from origin and spreading to thousands of acres within a few hours in spite of exceptionally fast and strong attack by the protective organization. Such fire behavior has been the outstanding characteristic of the 1931 season, and the really remarkable feature is that the organization was able to prevent all but a few fires from escaping control at small size.

A report has been prepared to make this information available both to the Forest Service and to all local timber protective organizations so that each agency can rate its efficiency of protection more accurately.

Analysis of Fire Records

Additional preliminary results were obtained during September sufficient to permit the establishment of new regional standards of relative need of protection by forest and fuel types; relative needs of visibility by types according to values at stake and according to probable rate of spread of fire; maximum permissible travel and searching time; the strength of attack according to the time the fire will burn and spread before the first men arrive; and the probable need of reinforcements. Although all of these determinations have been subjected to close scrutiny and occasional modification by good judgment of experienced men, further compilation and checking are under way to verify the results or to change them. The present standards are being used as a basis for the transportation planning now under way on the Clearwater Forest. Field application of these standards is expected to raise some questions and to point out additional facts needed before the results are finally accepted.

Arrangements have been concluded with the Regional Office for the preparation by Gisborne and Hornby of a new code to suit the new individual fire report, for coding of these data early in January, and for analysis by sorting and tabulating the data on the punch cards so that the Forests will be relieved of about three-fourths of the labor of compiling sheets A to H. This analysis also will permit an immediate comparison of results of fire control for 1931 with the results during 1921 to 1930 inclusive.

Transportation and Visibility Studies

Hornby, Yule, W. I. White, and Frank Cool in charge of Drafting are now on the Clearwater Forest planning the organization and transportation needed to provide that Forest with facilities capable of holding burned acreage within the permissible limits. The fundamental importance of quick detection as a means of saving time that otherwise might have to be saved by fast transportation is so well recognized that the two studies of visibility and transportation are being made hand in hand. Likewise, the desirability of using every man in the protective organization as a detector of fires affects the distribution of all men, hence the needs of transportation. Hornby is also giving special attention to the possibility of establishing secondary defence bases properly located to serve the time requirements and the probability of needing reinforcements shown by the fire record analysis for each forest type. Existing sources of labor will be used to the limit, but frequently these are not sufficient during the peak of a bad season in the more remote parts of this Region. Such bases are intended for use only during such peaks of danger, but the transportation system must be there permanently.

In this work the new travel and searching time standards, determined by the analysis of past records, are being used. These determinations show that the rate of travel per hour is not a constant for all

distances but decreases rapidly for longer distances travelled by horse and foot. For example, our data show that 2-1/2 miles may be travelled by foot and the fire found in a total of one hour, but this does not mean that a fire 5 miles away will be reached in two hours. Instead, only 1-1/2 miles is added for the second hour, and only one mile forthe third. This change of rate per hour is important as it extends the radius of protection that might be assumed for one hour travel and searching, but decreases the radius that would be assumed for three or four hours if a constant rate were used. In the application of these standards in this Region, the importance of searching time also is recognized and a deduction made from the total of travel plus searching time, shown by the original fire reports, in order to approximate travel time alone more accurately. This deduction is not a constant for all timber types, being greater for the more densely timbered types and practically negligible for brush and grass and for open yellow pine. The analysis of the 1931 fire reports is expected to provide definite data on searching time, which has never before been recorded separately.

Silviculture

Field work for this year on active silvicultural projects was completed toward the end of September. The fall examinations on the permanent methods of cutting and reproduction plots, including in some cases diameter growth measurements on residual trees, were finished on September 12. The next ten days were spent in remeasuring four permanent yield plots on the Kaniksu and some thirty semi-permanent yield plots on the Coeur d'Alene National Forests. This job was completed in record time in spite of rainy weather and the relatively large amount of travel time necessitated by the scattered plot locations.

Thompson assisted in this work in order to help push it through before the crew of field assistants disbanded towards the end of the month. This occurred immediately following the completion of the semi-permanent plot remeasurements, Willison and White returning to school; Agri leaving for Sweden by way of the Orient; and Williams, after a few days at Priest River, returning to Missoula preliminary to driving east to resume his teaching post at Syracuse. Williams proved a valuable and capable crew leader, accomplishing the work outlined for his party in a very satisfactory manner and in excellent time with a minimum of supervision.

In the office, Haig, with the aid of two computors, Misses Fain and Bouchard, has been busily engaged in checking numerous tables connected with the white pine yield study and in coding permanent yield plot data for card punching and analysis. These jobs are now practically finished and Miss Bouchard is already at work transcribing and summarizing the 1931 records on permanent methods of cutting plots.

Extensive Revision

Following the conference at Portland, Weidman worked over all the Region 1 growth figures, which it was desired to review critically in connection with the effort to get the data for the various regions in line with each other. This proved to be more of a job than some of the more optimistic of the conferees at Portland had anticipated. Watts also got in on this work in connection with the Region 4 portion of the Idaho growth data.

Due to the fact that Bradner had charge of all but the growth phase of the Extensive Revision work last winter, follow-up jobs on that project are coming to him to handle.

The last reply from well-informed lumbermen and other forest agencies in the two states to which the revised summary sheets had been sent for review and comment was not received in the office until the middle of September. The letter covering the replies and the corrected summary was sent to Washington shortly after the middle of the month.

Considerable work on the drain by cutting and the accessibility of the commercial timber within the two states was done during the latter part of the month. Assistant Regional Forester Koch worked up the percentages on the availability of the commercial timber in the national forests of Montana and north Idaho.

Forest Survey

Discussion of methods, plans personnel, and the preliminary organization to initiate the inventory phase of the Forest Survey occupied a considerable portion of Bradner's time during September. Forest Survey Director Granger remained in the Missoula Office until September 4, before returning to Region 6. Montana's State Forester and the Dean of Montana's Forestry School were both visited by Granger and Bradner and plans for the Survey discussed.

James Girard, logging engineer for the Survey, spent the last half of September in the Missoula Office conferring with Watts and Bradner and members of the Regional Office. Choice of methods, utilization standards, types and cover classifications, cruises and estimates, and volume tables were among the many subjects discussed. Girard accompanied Bradner on a visit to the lumber company offices of the Anaconda Copper Mining Company at Bonner, Montana; the McGoldrick Lumber Company at Spokane, Washington; the Deer Park Lumber Company at Deer Park, Washington; and to the Rutledge Timber Company (Potlatch Forests, Inc.), at Coeur d'Alene, Idaho. A majority of the lumbermen contacted seemed much interested in the Survey, and there is no doubt that the work will get full cooperation from practically all of the companies in the

Inland Empire. The main objective of the trip, however, was to get a line on the quality, detail and extent of private cruise data, and the amount of information available in the cruise records on growth, size, and quality of the timber both young and mature. Private cruise records vary considerably between companies, depending on the cutting practices and the character of the products manufactured. Rather complete cutting records are kept by most companies, and these will prove of great help in adjusting estimates. Western Montana timber of all species and the pine timber in north Idaho have in most cases been cruised and utilized to practically the same standards as will be set up for the Survey.

Preliminary work on the Survey has now reached a point where the plan of work for the inventory phase can be made by Bradner.

Products

The personnel of Products batted 100% on the last big fire in the Region which started at noon September 6 on Clear Creek on the Selway Forest. On September 7, Labor Day, Bradner, Anderson, Whitney, and Field Assistant Ibenthal were all on the fire, having made the trip from Missoula by plane. Fire crews had built 85 miles of held line by the 11th of the month, and by the 15th all of the Products men were back in the office.

During the fire season just ended, Products men have been tailed on fires as follows:

	Actual Days on Detail	No. of Fires
I. V. Anderson	54	8
C. N. Whitney	50	4
Wm. Ibenthal (Field Asst.)	54	8
M. Bradner	7	1

(A good fire record but hard on Research)

Woods Utilization Studies

Fire fighting details during the past three months have caused a serious interruption to Anderson's field program for the year. Logging camps and mills at which he had arranged for studies are closed down for the season or are not working in the type of timber or with the kind of equipment which it was planned to study.

Anderson left the office the last week in September to visit the tie operations in northwestern Montana, where he had planned to make a tie-mill study in the larch-fir type. The objective of this trip was to determine the feasibility of making certain studies yet this fall that would be supplementary to the main tie-mill study.

Condition of Hemlock Ties in Missoula Test Track

Service records on ties in the Northern Pacific test track at Missoula were brought up to date through an inspection made September 17 by Whitney, in company with G. R. Hopkins, Assistant General Superintendent of Timber Preservation, and Joe La Porte, local section foreman for the railway company.

In December, 1908, Mr. Andrew Gibson, former superintendent of Northern Pacific tie treating plants, wrote the timber agent at St. Paul asking that a few hundred western hemlock ties be furnished so that a test could be made with them after treatment at some point where they could be placed continuously and watched. These ties were purchased in 1909 and shipped to Paradise, Montana, for treatment. They were treated with 6.75 pounds per cubic foot of an 80-20 mixture of creosote and refined coal tar and placed in a section of the west bound main line track between Missoula and DeSmet, Montana.

During the first few years of service no systematic record of these ties was kept, and in 1928 it was found necessary to correct a few erroneous statements which had been carried forward from the first inspection report made by Mr. Gibson to the chief engineer in 1917. An examination by Wirka and Whitney of the Forest Service on September 8, 1928, using a description of location furnished by the railroad, revealed the fact that in addition to hemlock, some ties of other species had been included in the test. This led to a very thorough study of all ties within the limits of this test track, and as each tie has been correctly identified, valuable information will be obtained not only in the use of western hemlock but also Douglas fir, western larch, spruce and true fir ties laid at the same time as the hemlock in 1910.

The following statement contains a record of all replacements made for each species during 21 years of service.

Species	No. of Ties Originally placed	Replacements	
		No.	Per cent
Western hemlock	1,072	75	7.0
Western larch	436	8	1.8
Douglas fir	166	6	3.6
True fir	102	14	13.7
Spruce	18	5	27.7
Other species[o]	6	..	..
TOTAL	1,800	108	6.0

[o] Includes 1 aspen, 1 lodgepole pine, 2 western yellow pine and 2 white pine ties.

Nearly all of the western hemlock ties in this track are still in fairly good condition. Only 26 of them should be replaced in 1932.

The durability of western hemlock for cross ties as shown by this test to date compares very favorably with that of creosoted Douglas fir ties. Subsequent records may prove that the life of these treated hemlock ties is equal to the treated fir. The hemlock tie requires a longer period of air seasoning than the fir but checks very little in seasoning and takes creosote treatment better than the fir. The Northern Pacific Railway Company has purchased western hemlock ties in increasing proportions for the past four years and this year removed all restrictions as to allowable percentage of hemlock ties to be secured.

Lumber Prices

Average Mill-Run Prices	Annual 1930	1st Q., 1931	2nd Q., 1931	July, 1931	August, 1931
Idaho White Pine	$33.56	$31.41	$31.12	$31.35	$28.61
Western Yellow Pine	21.64	19.25	19.52	17.60	17.19
Larch-fir	17.32	14.26	13.53	13.25	14.57
White Fir	16.34	13.76	13.82	9.93	11.56
Spruce	21.93	18.39	18.94	18.04	16.68

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

General

The Station was host during the early days of the month at a conference held to consider the growth data in the Capper Report Revision in the hope of effecting consistency throughout the reports of the western Stations. Present were those who had had the principal part in preparing the growth phase of the Capper Report, namely, R. H. Weidman, L. F. Watts, Duncan Dunning, C. L. Forsling, W. H. Meyer, and Thornton T. Munger, and from the Washington Office, E. N. Munns, F. S. Schumacher, and W. H. Gibbons.

In the eastern part of this region, there is increasing interest in the role that forest and range management plays in water conservation and erosion, the water supply situation having been made very acute by the prolonged series of dry years. In order to advise the Region as to whether we had problems that might be helped by intensive study and to lay out the lines of study that are needed, Director Forsling spent the first two weeks of September here, mostly on the Wenatchee

National Forest of eastern Washington and the Fremont and Deschutes of eastern Oregon. He was accompanied on these trips by Assistant Regional Forester Kavanagh, Range Inspector Dutton, and Director Munger together with the local officers of each forest. Instances of sheet and gully erosion were studied and much profitable discussion was had. We feel much stimulated by Forsling's visit to activity in the field of water conservation and erosion research, and are hopeful that funds may soon be provided us.

Mr. Munns paid us a long postponed visit of two weeks, it having been four years since he was last here. After the growth conference, he had a taste of field work by joining in the remeasurement of some Douglas fir plots with Meyer on the Olympic Peninsula.

The first Region 6 ranger training school will be held at Wind River during October, and the Station has turned over to the school two of its buildings there. The living and dining rooms of the so-called Director's house make a very good lecture room for this group of thirty and the faculty will be housed in this house and in the adjoining house vacated by Simson.

Section of Forest Products

On August 31, J. Elton Lodewick, new Chief of the Section of Forest Products, reported for duty at Madison, Wisconsin. He spent ten days in becoming acquainted with the members of the Laboratory staff and in becoming familiar with the projects then underway. He left Madison on the ninth and reported for duty in Portland on the fourteenth. Since then he has made several short trips to logging and sawmill operations. Most of his time has been spent in the office going through the files, and particularly in revising the filing system for the section of photographs.

Minor Forest Products Study

Johnson devoted the bulk of his time to this study. To date reports have been completed covering fuelwood, poles, pilin[illegible], fence posts, hewed ties and timbers, pulpwood, and shingle bolts.

The total reported fence post production in 1930 for Oregon and Washington amounted to 1,782,066 pieces, 98 per cent of which were produced in Washington. Reported railroad purchases and shipments to other states amounted to 1,497,018 pieces, leaving about 285,000 posts for use within these states. It is estimated that the post requirements on the farms of Oregon and Washington in 1930 amounted to 3,901,196 pieces; 1,873,734 in Oregon and 2,027,426 in Washington. On the basis of the reported production and the estimated farm requirements the estimated total production of posts in these states in 1930 was 5,[illegible]88,214 pieces. Western red cedar supplied about 80 per cent of the posts produced,

western larch 10 per cent, Douglas fir 3 per cent, and the remaining 7 per cent was of western yellow pine, oaks, western juniper, lodgepole pine, and miscellaneous species. The total wood volume entering into fence post production was about 10,800,000 cubic feet.

The hewed tie production of Oregon and Washington amounted to 121,600 pieces, or 3,734,880 board feet. About 80,920 ties were produced in Oregon and 40,680 in Washington. Douglas fir supplied about 50 per cent of the ties, lodgepole pine 38 per cent, Port Orford cedar 9 per cent, and western larch and western hemlock the remaining 3 per cent. There has been a decrease of approximately 82 per cent in hewed tie production since 1914 in these states.

The production of hewed timbers in 1930 amounted to 383,890 board feet; 207,718 board feet in Oregon, and 182,172 in Washington.

The total production of forest pulpwood (cordwood size) in Oregon and Washington in 1930 was 256,150 cords; 90,277 cords in Oregon, and 165,873 cords in Washington. Western hemlock supplied about 50 per cent of the production, white fir 25 per cent, Sitka spruce 17 per cent and black cottonwood 8 per cent.

Breakage Losses in Felling Timber

Rapraeger has returned to the Station after six weeks' work in five camps in the Douglas fir region to obtain information on breakage losses in felling timber. Over 1,100 Douglas firs and western hemlocks were measured which had an approximate gross merchantable scale of 8-1/2 million board feet. These trees ranged in size from sixteen inches to nearly ten feet in diameter breast high. The calculated weight of one large tree, including the bark was 107.12 tons. The impact when such a tree falls is terrific, and the forces involved tend to induce severe breakage unless the bed is even.

Western Yellow Pine Mill Studies

Rapraeger has begun a report in which the information relating to logs from the Mt. Emily Lumber Company and Shevlin-Hixon Lumber Company studies is combined. The object is (1) to strengthen the entire group of data by having a larger number of logs (5,125) as a basis, and (2) to compare the two mills in points where fundamental differences occur. This comparison can be readily made because (1) both studies were made within an interval of a year, (2) similar technic was used in each case, (3) both studies were supervised by the same individual, and (4) the major portion of the field crew performed similar duties at each mill.

Fire Studies

The new fire studies laboratory is rapidly being cleared for action. Partitions are now up and equipment is being moved in. A chamber for testing fuel moisture content relationships is now being constructed; control of temperature and humidity will be automatic.

The C-O Two Company is cooperating with us in tests to determine the efficiency of carbon dioxide gas in controlling or extinguishing forest fires of various types. This is an enlargement of the original test made by McArdle several years ago. We are making no prediction as to the outcome of these experiments, but carbon dioxide has been used very successfully in extinguishing fires heretofore difficult to control. Preliminary tests were made a short time ago to let the C-O Two men get the "feel" of our problems; final tests will be made early this month.

Reporting and Charting Lightning Storms

The occurrence and movement of lightning storms in Washington and Oregon have been plotted for all except two years of our 8-year record. Plotting is done on tracing paper, each day's storm being kept on a separate sheet. In this way duplicate observations are eliminated and the course of each storm shown with a reasonable degree of accuracy. The width of a single storm may be from one-half to 25 or more miles. There appear to be rather well-defined zones of storm occurrence and movement. Depending on the point of origin, most of the storms in the region can be expected to travel in certain directions. For example, the storms originating south or west of Ashland are generally short and do not extend very far northward; those forming the Klamath Marsh region generally go northeast for 85 or more miles. Those forming near Summer Lake often go northwest into the Cascades, but those forming south or east of Summer Lake generally pass to the north or northeast. Storms starting in the Cascades north of Diamond Lake go northward and are of considerable length, although they do not appear ever to cross the Columbia River. The speed of storm travel varies greatly from about 3 to 24 miles an hour. Morning storms appear to be rather frequent in the Cascades, but are infrequent in the Blue Mountains. We have kept separate the days of storm occurrence partly to facilitate analysis, but also to enable the Weather Bureau to correlate these data with the weather statistics and thus improve the lightning storm forecasts.

Smoke Detection Studies

Field work was completed for this season on the smoke detection studies centering on the Deschutes Forest. Several hundred observations were made under conditions of good, medium, and poor visibility to determine how far the smoke from small fires can be seen with different atmospheric conditions. The data have not yet been analyzed completely,

nor combined with supplementary observations taken on three other forests, but preliminary inspection indicates that under average summer conditions of visibility, the lookouts, especially low elevation lookouts, can not be relied upon to pick up small fires at distances much in excess of 5 miles.

Static and Lightning Storms

Field work for this study was completed without having actually experienced any storms of marked intensity. A large amount of necessary work of a preliminary character was done. This includes investigations to determine the best wave length to use for detecting local static disturbances, the important discovery that future work of this character must be done with aerials protected entirely from wind, and the development of a more powerful and sensitive instrument to record and measure static intensity. Further work will be done this winter in cooperation with the physics department at Reed College.

Hour Control Study

The typing of tables was completed during the month and except for the completion of two extra sets of charts and the completion of a text statement, the hour control studies for the eastern Oregon and eastern Washington forests are completed.

Mensuration

Douglas Fir Permanent Growth Plots

Meyer made the remeasurement of eleven permanent growth plots thereby adding another chapter to our knowledge of the trends of these stands to or from normality. The past history of the plots has demonstrated vividly that single five-year periods are of little use in showing growth trends, and that results will be reliable only after repeated periods have been recorded. Net growth is not steady, since it is dependent upon mortality. Mortality may be due to ordinary suppression or to extraordinary causes, such as insect attack, wind, or ice damage. For instance, in these last measurements we find two tracts upon which the damage has been very heavy because of windfall and windbreak, while on the remaining five tracts the damage has been very light. In the next cycle the condition might be quite otherwise. Mortality by ordinary suppression rarely amounts to over one per cent of the volume in a five-year period, but wind damage as high as eight per cent has been observed without being of a catastrophic nature, that is to say, still leaving the stand in good condition. Such irregularities in mortality are unavoidable and unpredictable. Hence permanent plots must be large and be maintained a long time to be of any value.

Silviculture

Douglas Fir Natural Reproduction Studies

The fall rains set in rather early and when the final examinations were made of the sample plots in the Upper Wind River Valley, the measurement of physical factors was discontinued and the study closed for the season. Once more the seedling loss was heavy, exceeding 85 per cent, but this year the major portion of the loss occurred from drouth; in previous years most of the loss occurred early in the season and was attributed to direct heat injury or consumption by mice.

During the latter part of the month Isaac made the final examination of semipermanent reproduction plots and seed tree areas at Westfir on the Cascade Forest. There on the sale area, there has been no opportunity to burn for over a year and 1200 acres of slash in a solid body has accumulated. This must now be burned as a fire protection measure and it is a regrettable fact that the area is quite well stocked with seedlings as a result of last year's medium cone crop and there may not be another seed crop for several years.

Douglas Fir Heredity

Kolbe with the help of Morris and Litchfield spent approximately three weeks making the triennial measurement of the Douglas fir heredity plantations, which are located on the Siuslaw, Mt. Hood, Columbia and Snoqualmie Forests. These are now 16 years old since planting. A marked difference exists between the plots because of site. This year's measurement shows that the trees on the best area are approximately four times larger than those on the plot of the poorest site. It is regrettable that considerable damage is still being done by mountain beaver girdling and falling snags.

Forestation

Several collections of seed have been made by various members of the Station for our own arboretum use and to send to our correspondents; we were particularly glad to get after years of effort a little supply of the rare and inaccessible alpine larch. A local wild flower seed collector was given the contract of filling a rather large order from the Norwegian Forest Experiment Station.

Forest Insurance

During September the office work-up of the data collected from field analyses in Coos County was completed and the figures were combined with

those from the other counties worked in so that the field analysis phase is now fully completed.

The causative hazard study phase has been practically completed also during September, there remaining now only two hazard factors in two counties to be completed. These must wait on detailed information not yet available from the forest survey. Since the amount of work involved in completing this phase is now very small, it can virtually be called finished.

The contributive hazard study phase has also been completed during the month in the sense that the summarization of all the supplementary individual fire reports has been made, the county summaries having been combined into summaries for the whole region.

Several methods of work-up have been applied to the climate data collected for the climatic hazard study phase, and final conclusions in this phase are imminent. Quite widely varying methods yield results surprisingly close to each other, and it appears that a workable and understandable method of climatic classification is practically an established fact.

The only phase of the data collecting activity that now remains uncompleted is that with respect to protection grading. Since this phase has features of general interest, it is being conducted in collaboration with the Clarke-McNary law administration. E. H. MacDaniels, of the Regional Office, has been successful in soliciting and obtaining cooperation, and definite progress has been made.

The program at this date is to begin final assembly of hazard rating data, to further the protection study, and to begin to give serious thought to the question of forest valuation for insurance purposes.

Selective Logging in Douglas Fir

Material progress has been made in the compilation of the great mass of logging cost data which Brandstrom has collected. These data were taken at 45 settings illustrative of 7 types of logging and cover 40,000,000 feet of logs. Brandstrom will have some preliminary results to report at the Logging Congress in October at which both he and Munger have papers under the general title "Logging Profitable Logs: A Discussion of Economic Selection in Logging".

In order to gather data as to the application of the selective logging principle to an actual tract, a hundred per cent quality and quantity cruise is being made of two or three sections in the Wind River Valley on the proposed experimental forest. This cruise is being made with the liberal cooperation of the Regional Forester who supplied

six trained cruisers, the Experiment Station paying their expenses only. The cruising party is headed by Fred A. Matz; Brandstrom and Munger were in the field with this crew when the work started.

Forest Survey

During the month of September type mapping of the private lands in Wahkiakum and Whatcom Counties, Washington, and southern Tillamook County, Oregon was completed, making a total of ten Oregon counties and five Washington counties completed.

Adjustment cruising has been completed in seven Oregon counties and five Washington counties. Results of this work in one of the heavily timbered counties gave the following results: On 5320 acres check cruised the total of all species taken from the owners' cruises amounted to 98.8 per cent of the check cruise, a difference of only 2.2 per cent. In the same county on 7673 acres the county cruise was 102.97 per cent of the check cruise, a difference of 2.97 per cent. Taking the species separately, a greater variation is obtained. The principal species, Douglas fir, was for the private cruises 102.04 per cent of the check cruise, and for the county cruise 111.27 per cent of the check cruise.

The base maps for the western half of Washington and of Oregon have been completed and are now ready for distribution to interested parties for criticism and comment. It is on these new base maps that the type maps for the region will be superimposed.

The work of mapping in place and check cruising has gone ahead full swing with every member of the survey in the field.

By the end of September most of the field work on the national forests was completed. At this date it appears that this fall will see field work completed on all national forests, but the Siuslaw and the Olympic and possibly a slight amount on the Mt. Baker.

A working plan for checking the work done on the national forests was completed and approved, and Kline and McLennan spent most of the month checking the work done on the Umpqua and Cascade National Forests. At the end of the month Kline was loaned to the Regional Office to make an appraisal of lands involved in an exchange.

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SOUTHERN FOREST EXPERIMENT STATION

General

Dr. Carl Hartley of Washington spent considerable time with Dr. Overholtz and Kaufert, discussing plans for the hardwood pathological

studies to be carried on during the coming year. Both Dr. Hartley and Dr. Overholtz left during the early part of the month. In a general conference with Demmon, Lentz and Putnam, it was decided that emphasis in the pathology studies in the hardwoods should be placed on the effects of fire and rot on the younger diameter classes.

Demmon spent several days during the early part of the month at Lake City, Florida, where he discussed plans for the development of the Olustee tracts, with members of the Naval Stores staff. Dr. Skinner, Dr. Veitch, Dr. Spoh, and Messrs. Shingler and Reed of the Bureau of Chemistry and Soils joined in the discussion of plans for the development work.

On September 23, Demmon and Putnam attended the meeting of the Forestry and Paper Committees of the Industrial Bureau of the New Orleans Association of Commerce, to discuss the Pulpwood Report prepared by Mr. Schneider. Putnam had helped in the collection of data for this report.

Prior to Dr. Ziegler's departure for Pennsylvania, Demmon discussed with him plans for the continuance of the Financial Aspects studies. Dr. Ziegler's resignation from the Station became effective September 30. He left to become Director of the Pennsylvania Research Institute at Mont Alto.

Ralph M. Lindgren, Assistant Pathologist of the Bureau of Plant Industry, who has been attached to the Station and has been carrying on studies in sap stain prevention, left to continue graduate work at Madison. Ted Scheffer has also gone to Madison to carry on work for an advanced degree. Dale Chapman is carrying on the work inaugurated by Lindgren.

Management

Roy Chapman spent the greater part of his time working on the fire and thinning data from the Urania plots, prior to his departure for Washington, where he will be on detail in the Office of Forest Measurements. He will also take advanced courses in statistical analysis work. Bickford spent the month going over the plot work with Chapman and in computing and checking plot data prior to taking over Chapman's work.

Wahlenberg and Bennett spent the first week of September looking for suitable fire plots in Alabama. Contacts were made with the fire wardens and land agents of several lumber companies. Wahlenberg reports seeing some sixteen-inch longleaf pine killed by a spring fire. Strips were run in various stands to get data on fire damage. Dr. Hartley and Siggers accompanied the Management crew on one trip and reported finding brown spot more prevalent on rough areas than on annually burned fire lines.

Wahlenberg, Bennett and Riebold started fire studies at Bogalusa, cooperating with Wakeley and with J. K. Johnson and Mr. Garrison of the Great Southern Lumber Company. Wahlenberg had a conference with S. W. Greene and Extension Forester Lauderburn at Poplarville, and, later with Bond and Putnam, spent a day with the Survey crews working the northern portion of Pearl River County.

R. J. Riebold, principal Forest Ranger on the Ocala National Forest, has been loaned to the Station by Region 7 to assist in fire studies.

Naval Stores

General

Five weeks of drought, with only half an inch of rain divided into three showers, have brought about a condition locally which is becoming critical. On our longleaf tract, dry face is beginning to show up, and the yield has fallen off in spite of the fact that September was a very warm month.

Methods of Chipping

Damage continues to develop in the French turpentine thinning experiment. Over 90 trees are now dead or dry faced. Blocks of wood were collected from the Interval of Chipping tests for Miss Gerry. This requires the cutting of the streak an inch and a half high on not only the trees which have had the blocks removed but also on all others with which they are being compared. This has upset the yield records a little and made it necessary to throw out one week's record entirely. Gum samples were collected from aluminum, clay and galvanized cups for Mr. Hall at the Forest Products Laboratory.

NS-3 Fire

At Raiford the removal of all trees from around the plots which we are working has left them isolated in the midst of a 15-acre field. The cutting of the trees around has started an epidemic of Ips. These insects have already killed three trees on one plot. The brush is now being burned and that, with the advent of cooler weather, may hold down further damage.

NS-3 Weather

Miss Gerry, Mr. Koehler, and Mr. Hall have suggested the possibility of a correlation between gum yield rate and stem size fluctuations as shown by a dendrograph or transpiration rate or other

factors which may affect the internal pressure in the trees.

Seed fall from slash pine started during the week of September 14-19. In one week's time, one good seed was found in one out of every ten turpentine cups at Sampson Lake.

Olustee Tract

Harper returned from his six months' assignment in Washington. He stopped off at Asheville on his way south and visited the Bent Creek Forest and the Branch Station. At Olustee he helped the Bureau of Chemistry and Soils men get started on their building site. Furniture was moved from the office at Starke to the Lake City offices, which were occupied September 19.

Mr. Santos Hall, the Portuguese forester who has been working with Schumacher in the Washington office, spent several days with Harper becoming acquainted with the experimental work and program at Olustee.

Heyward spent the first week in September on his root study report. While on annual leave, he conferred with Dr. Romel of Cornell and Dr. Lyon of the Cornell Soils Department, and inspected lysimeter installations at Ithaca and Geneva, New York. In Washington he discussed soils problems with Doctors Bennett, McCall and Schreiner.

Osborne continued collecting historical data pertaining to the Olustee tract. He and Diller laid out thinning plots. Osborne and Liefeld made maps of the fire and reproduction plots. Ivy poisoning laid Osborne up for six days. (Use 5 per cent solution of potassium permanganate as a wash to cure it. G.H.Lentz.)

Forestation

Wakeley finished the greater part of the first draft of a preliminary report on naturally reproduced longleaf pine on 9,500 acres at Bogalusa, Louisiana. This area was logged 1920-1922 and seeded in from the 1920-1921 seed crops. All variations of burning are present on the area. Several strips were run in the South Pasture at Bogalusa to get height frequency data of eleven-year-old pine seedlings.

Protection, Grazing

During the first three weeks of September, Pessin worked at McNeill, Mississippi on a study of seedling competition on numerous quadrats. Watkins worked with him until September 15, when he left to enter Tulane University and Huberman arrived to take his place. From September 24, Pessin was at Camp Pinchot, relieving Gemmer, who took his annual leave.

Ecology

The ecological studies at McNeill were continued by Watkins and Huberman under Pessin's supervision.

Camp Pinchot

Captain I. F. Eldredge spent several days at Camp Pinchot with Gemmer. Eldredge, Broadbent and Gemmer spent some time visiting various parts of the Forest and studying the longleaf pine reproduction. Eldredge believes that the best pine reproduction on the Forest was advance growth from seed crops prior to 1913. These trees are now 7 to 15 feet tall. The 1913 and 1920 seed crops probably failed to establish reproduction due to subsequent drought. Gemmer drew up a plan for the arboretum to be established this winter. Three 50 x 3 seed beds were put in and 2 were planted to longleaf pine.

Financial Aspects

Dr. Ziegler and Spillers spent most of their time on the Extensive Revision of the Capper Report. Conferences were held with District Inspector Eberly, Charles F. Evans from Asheville, and members of the Southern Pine Association in order to correlate stand and growth data. Dr. Ziegler also assembled the reports of the studies in Bradford, Hamilton and Osceola Counties into one single report. At the end of the month Dr. Ziegler left for Pennsylvania.

Spillers made a trip to Memphis to confer with members of the Hardwood Manufacturers' Institute on the hardwood data for the Capper Report revision. He also conferred with several timber appraisers on the hardwood stand figures. During the early part of the month Spillers worked in Hempstead County, Arkansas with Mr. Hall of the University of Arkansas. Woodland studies were carried on in several townships. Mr. Gillette, Extension Forester for Arkansas, and Reynolds from the Station staff also assisted in this study. One hundred and fifty farms, with their timber lands, were studied in Hempstead County.

Reynolds wrote up a general history of logging in Polk County, Texas for Mr. Boyd, of the Southern Lumberman. He also prepared two short articles for the Forest Worker.

Bond worked on reports for Polk County, Texas and Hempstead County, Arkansas, including the lumber cut from farm woodlands. He also compiled data for the Capper Report revision on the quantity of mine timbers cut in the South. During the latter part of the month he worked on the revision of projects and plans for future work for the Financial Aspects study and wrote up the annual report of the study. On September 27 he made a short trip to Pearl River County to become

acquainted with the Pine Survey and to offer suggestions concerning this phase of the Forest Survey. This county may be studied later by the economics group, and the Survey data may be of great help in the Financial Aspects study.

Erosion

Sinclair and Meginnis returned to New Orleans on September 1 after about two months in the field. The first half of the month was spent in the office working on data collected from the erosion plots at Holly Springs, Mississippi following the first six rains, working on the erosion photographic collection, and on a working plan for the erosion project.

Meginnis spent the last half of the month at Holly Springs, Mississippi, where he continued taking records from the run-off plots already established and in preparation for the establishment of other plots to enlarge the series. Bennett joined him at Holly Springs September 28.

Sinclair remained in the office to get all the records and reports pertaining to the erosion studies complete to date.

At New Orleans, Meginnis revised a prospective bulletin on "Effective Soil Binding Plants for Reclaiming Gullied Lands in the South". He reports that there is considerable locust borer damage on the locust planted inside the fenced erosion area. A collection of native legumes and grasses on the experimental areas at Holly Springs has been made.

Forest Survey

Hardwood Phase

The collection of data for the hardwood volume tables was completed during the early part of the month under Putnam's and Winters' supervision. All of the field crews came in by September 11, and the office work on the data was begun. The general procedure worked out by Girard and Putnam last spring is being followed and tables based on various ratios between D.I.B. and D.B.H. are being built up. The various species are then grouped according to the ratios determined so that one table can be used for several species having approximately the same taper.

Putnam and Lentz went over the growth figures for the bottomland hardwoods for the Capper Report revision, and suggested several minor changes.

Putnam worked up a report on the Thistlethwaite Hardwood preserve of 11,000 acres in St. Landry Parish, Louisiana. The field work was carried on during the fall of 1930 with Winters and Bull cooperating. Putnam collaborated with Mr. Schneider of the New Orleans Association of Commerce and the timber estimating firm of Lemieux Brothers in the preparation of a prospectus on the pulp and paper resources contingent to New Orleans.

Pine Phase

Lehrbas and Cruikshank spent three days in Pearl River County, Mississippi getting acquainted with the roads, checking timber types and in general getting information which will allow for more efficient planning of the field work.

Lentz worked over the preliminary plan for the Pine Survey and incorporated in it many of the changes suggested by members of the Station staff and men in the Washington office. The plan is no longer "a hash of hardwood soup and pine pulp". Several copies of the Plan have been typed, but no mimeographed copies have been made.

The general plan for the preliminary Pine Survey follows the principles laid down in the hardwood plan. Forest types, sites, etc. had to be changed to meet the changed conditions. Due to the different conditions of longleaf and slash pine stands as a result of turpentine operations, and also the more urgent need of recording reproduction more accurately, the procedure in the pine lands has not proven as simple as was first contemplated.

Headquarters were established at Poplarville, Mississippi on September 23, and the northern end of Pearl River County is being worked from there. Work on line one was begun September 24 and about 20 miles of line had been run by October 1. Extremely high temperatures made running the line a hot and tiring job for the first four days, but since the 27th more favorable climatic conditions have prevailed.

Mr. Reed from the McNeill Branch Experiment Station is following our crews and on each cut-over plot is making a study of the forage conditions. This study will give us a picture of grazing possibilities, whereas the Survey data will show the forest conditions of the county.

Logging operations have removed nearly all of the merchantable pine from the northern part of Pearl River County, and over large areas nothing but scrub oak is now found. Large areas not under fence have failed to restock due to fires and hogs. The "bays" or creek bottoms contain some hardwood timber - swamp black gum, tulip poplar, bay and a few minor hardwoods, with now and then a scattering of slash or loblolly pine. The hardwoods for the most part are of inferior quality and in scattered stands. Only one portable mill is now operating in the northern portion of the county where formerly four or five large mills had operated in the pine timber.

Hardwood Growth and Yield

After returning from his annual leave, Winters took a three-weeks' extensive survey trip through the bottomland region of southern Missouri, Arkansas and Mississippi. This survey showed that even-aged red gum and oak stands that seeded in on abandoned fields at the time of the Civil War are uncommon north of the extreme southern part of Arkansas. The early plantation development originated near the mouth of the Mississippi River and moved northward. At the time of the War, its northern extreme must have been in southern Arkansas. In Louisiana these old field stands are rather common.

Timber production in the bottomlands is handicapped by the drainage and levee taxes, but the northern part of Arkansas probably suffers more severely from the tax burden than other parts of the region. Some cut-over lands are taxed as much as four dollars per acre per year for drainage alone. State and county taxes are levied in addition to the drainage tax. Two dollars and fifty cents to three dollars per acre per year is a common amount for the drainage tax, in this part of Arkansas. Needless to say, much land is being abandoned, and the abandoned land problem is assuming alarming proportions.

Bull took his annual leave during September, and while in New Haven took time to visit the Northeastern Station and discuss hardwood problems with Director Behre. Upon his return to Washington, Bull resumed his work on the analysis of the Hardwood Survey data. While in New Haven he had a conference with Professor Hawley on the southern hardwood forest types. As a result of this conference, several changes in type nomenclature were suggested.

Forest Pathology

Pine Disease Investigations

Siggers spent the first week in September in a field trip through southern Mississippi and Alabama and western Florida to study the relation of fire to the brown spot needle blight of longleaf pine seedlings. On the same trip an examination was made of the condition of trees in two National Cemeteries.

The rest of the month was spent in New Orleans attending to administrative duties and writing the following reports: (1) a report on the condition of trees in National Cemeteries at Mobile, Alabama and at Fort Barrancas, Florida; (2) the Annual Report for the Director of this Station, and (3) a statement on the relation of fire to the brown spot needle blight of longleaf pine seedlings.

Hardwood Disease Investigations

Kaufert continued the work upon the relation of fire scars to decay in the southern hardwoods. An attempt was made to determine how high a mortality could be expected in young hardwood stands injured by fire. These preliminary observations seemed to indicate that decay entering through fire scars is one of the chief agents causing the dropping out of young trees and contributing towards understocking. A start was made upon a study of the cultural characteristics of some of the fungi causing the heart rots of hardwoods. The last part of the month was spent finishing up several pieces of old work.

Forest Products Pathology

The chief activities in forest products pathology for September, 1931 were: (1) The practical completion of the season's experimental work in the field on the chemical control of sap stain and mold in domestic and export lumber; (2) the completion of the preliminary small scale tests of chemical treatments for the prevention of deterioration in stored logs; (3) the beginning of further commercial tests of the more promising log treatments.

The results of the lumber tests largely confirmed those of last year; the ethul mercury chloride and borax treatments proved somewhat better than the others used. It was also shown that weather conditions have a pronounced effect on the efficiency of the treatments, that failure to use the treatments properly will result in unsatisfactory control of stain, and that a number of improvements may be made by the manufacturers to further insure the effectiveness of the treatment. The small scale log treatment tests have revealed three or four treatments effective in controlling stain and decay but not insect damage. Commercial tests of these materials for use during the normal banking season when insects are apparently not a factor in deterioration are now being started.

This work, previously carried on by Lindgren, has been taken over by Dale Chapman.

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RESEARCH ACTIVITIES DURING SEPT. IN R-2

At the Fremont Station the first half of the month was given to the regular fall observations in the various seed production and source of seed studies in Engelmann spruce, Douglas fir, and western yellow pine. The prolonged drouth during the summer probably was responsible, in part

at least, for the early ripening of the local cone crop of these species. Even as early as mid-August squirrels were observed in the act of harvesting western yellow pine cones. By the first of September their activities along this line were in full swing, which made it necessary to conclude the experimental counts as quickly as possible. The western yellow pine and Engelmann spruce cone crops were especially heavy while that of Douglas fir, due to the almost complete destruction of the flower crop by late spring frosts, was almost a complete failure. The same condition held for the pine cone crop in western Nebraska; the special Nebraska seed trees yielding the smallest crop in the six years during which this phase of the seed source study on the Nebraska has been under way.

In connection with the cone-hoarding activities of squirrels, an interesting biotic problem, affecting the life history of western yellow pines, is presented by the study of the cone crop of one particular tree in the FS-101 (c) series. This tree produced a total of 454 cones, a very heavy yield for a 14" tree. Of these, 399 were cropped by squirrels as determined from a count of cone stalks lying underneath the tree. (It was observed that the cones were chewed up in the tree and none were carried away). The interesting feature of this study is not, however, the loss of 88% of the seed crop, but the fact that 141 branch tips were cut off by these arboreal rodents to enable them to get to the clustered cones. When their task was completed hardly a branch tip was left on the tree, which presented a peculiarly squared off appearance. If this thing takes place at periodic intervals during the life of the tree, it is apparent that its growth habit is appreciably influenced by such biotic disturbance.

On the 11th, Roeser was called in to Denver to confer with Mr. Gibbons of the Washington Office, who is rounding up the extensive revision of the Capper Report, and Mr. Donery of the Regional Office, regarding the revision of the growth data in the preliminary draft of the R-2 report. The revised draft, following its working over by Messrs. Donery and Higgins, was about ready for submission to the Washington Office at the close of the month.

On the 12th, a committee consisting of Regional Forester Peck, Assistant Regional Foresters Thompson and Hatton, Higgins, and Roeser met with Mr. Chapline and outlined a broad tentative plan of erosion-streamflow investigation within the Region following Mr. Chapline's inspection trip in the Front Range country of the Pike Forest. The important feature of the conference was the recognition given to the vital water conservation problems pertaining to the granitic formations in the Arkansas and Platte River drainages, in addition to the serious erosion per se problems of the Colorado River drainage on the Western Slope. Mr. Chapline stated that he was considerably impressed by the magnitude of the former problem and the need for prompt corrective action.

Roeser spent the last half of the month on the Nebraska Forest, giving particular attention to the periodic remeasurements of the various thinning plots in jack and Scotch pine plantations started in 1911. To the ten plots established in 1923 and 1926, six of which are in jack pine, which ranks next to western yellow pine in importance in the sand hills plantations, two additional ones were added to determine, if possible, the effect of thorough pruning, as undertaken in the 1930 thinning operations, upon the subsequent growth of the planted trees.

The latest remeasurements appear to substantiate the results obtained in the first remeasurement of jack pine to the effect that the rate of diameter accretion varies directly with the degree in which the stand is opened up, based on densities of approximately 1500, 1100, and 700 trees left per acre. In stands averaging about 4" d.b.h. maximum 5-year diameter increases of 1.8" were obtained with maximum height increases of about 9 feet. During the same period growth in Scotch pine, which is the particular prey of the little-understood but destructive pitch moth, has, if anything, excelled that of jack pine especially in the way of height increase. No data on volume increments are, as yet, available. Losses during the past five years, except in the unthinned control plots, where the original spacing was 6x3 feet, were very few.

The four meteorological stations in the type (T-1) study were inspected, and the equipment overhauled where this was necessary. The various test of species plantations (Fp-101 et al (a)), for which Supervisor Nelson prepared a comprehensive report covering twenty years' observations during the past year, were also inspected to procure information necessary to pass upon the final disposition of the plots in the experiment.

Roeser stayed over in order to represent the Regional Forester at the Nebraska picnic, which was held on the 26th of the month. This annual event, which is sponsored jointly by the Forest Service, the Nebraska Extension Service, and the town of Halsey, is focusing statewide attention upon the possibility of clothing the Sandhills, which constitute almost one-third of Nebraska's area, with a forest cover. It was attended by 800 people.

At Fremont, effort was concentrated in laying in winter supplies during the last two weeks. The growing season came to a close on September 10 with a 31% precipitation deficiency. Only .87" of rain were recorded for September, which witnessed the summer drouth drag through its third consecutive month. By the close of the month it had become impossible to procure soil moisture samples in south slopes by the orthodox augur and geotome methods. The average moisture content, to a depth of 20 inches, had fallen to approximately 2%.

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MANUSCRIPTS

APPALACHIAN

Eroded Old Fields as Forest Sites. (For Forest Worker)

SOUTHERN

Practical Forestry Ideas for Farmers (For Florida Grower)

Timber Revenues from Woodlands on Florida Farms (Jacksonville Journal)

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Burleigh, T. D.	Bird Life of the Great Smokies. Asheville Citizen Times. Sept. 6 - The Crossbill Sept. 13 - The Raven Sept. 20 - The Red-breasted Nuthatch Sept. 27 - The Carolina Junco
Frothingham, E. H.	Drought May result in Lasting Damage to Forest Trees (Yearbook for 1931).
Gisborne, H. T.	Lightning on the Lookouts. (Am. For. Sept. 1931)
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Pearson, G. A.	Recovery of Western Yellow Pine Seedlings from Injury by Grazing Animals. (Jour. of For. Oct. 1931)
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